Caxamarca, a New Monotypic Genus of Senecioneae (Asteraceae) from Northern Peru

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ABSTRACT. A new monotypic genus of Asteraceae–Senecioneae, *Caxamarca*, is described from northern Peru. The single herbaceous perennial species, *Caxamarca sanchezii* M. O. Dillon & Sagástegui, is endemic to the seasonally dry valleys of southwestern Cajamarca. The potential relationships of the genus are discussed.

RESUMEN. Un género monotípico nuevo de Asteraceae–Senecioneae, *Caxamarca* se describe para el norte de Perú. La única especie, la herbácea perenne, *Caxamarca sanchezii* M. O. Dillon et Sagástegui, es endémica de los valles estacionalmente secos del suroeste del Departamento de Cajamarca. Se discuten las relaciones potenciales del género.

During continuing detailed studies on the flora of northern Peru, the following monotypic genus of Senecioneae (Asteraceae) was encountered in the seasonally dry river valleys in southwestern Cajamarca. This new genus is proposed after an exhaustive examination of all available genera within the tribe and detailed studies on many neotropical members of the large and complex genus *Senecio* L. While generic concepts within the Senecioneae have been reviewed (Barkley, 1985a; Barkley et al., 1996; Bremer, 1994; Nordenstam, 1978), future changes are to be expected as taxonomies are tested with data from other disciplines, such as molecular systematics.

Caxamarca (Asteraceae tribe Senecioneae) M. O. Dillon & Sagástegui, gen. nov. TYPE: *Caxamarca sanchezii* M. O. Dillon & Sagástegui.

Herba rhizomatosa usque ad 1.5 m alta, radices carnosi foetidi; caules erecti simplexalata medullosus. Folia basale 40–50 cm longa, profunde pinnatisecta. Folia caulina alterna, herbacea, sessilia, basi decurrentis; lamina plana herbacea 20–35 cm longa, 7–11 cm lata, margine distincte denticulata. Capitulescentiae corymboso-cymosae 3–20 capitulis (vulgo 3–7). Capitula heterogama radiata ca. 10 mm alta, ca 10 mm lata; phyllaria subbiseriatis 17–28 (vulgo 22–28). Flores radiati pistillati 10–22; ligulae luteae, 10–25 mm longae, 4–8 mm latae. Flores disci hermaphroditi 80–160 (vulgo 80–130); corollae tubulosae luteae, 12–15 mm longae; limbus profunde quinquelobus. Antherae basis sagittata; collum filamenti basi dilatatum. Styli rami apice conico pilis penicillum centrale. Achaenia decemcostata pilosus; pappi setae biseriate 6–7 mm longus barbellatae persistentes.

Caxamarca sanchezii M. O. Dillon & Sagástegui, sp. nov. TYPE: Peru. Dept. Cajamarca: Prov. Contumazá, Alrededor de San Benito, 1200 m, 12 May 1994, *A. Sagástegui A., S. Leiva & C. Sagástegui 15185* (holotype, HAO; isotypes, CPUN, F, MO, US). Figures 1, 2.

Perennial herbs to 1.5 m tall; roots fasciculate, tuberous, malodorous, individual tubers 8–12 cm long, 2–3 cm diam., white; stems fistulose, 1–2.5 cm diam. at the base, unbranched, glabrous, winged by the decurrent leaf bases, the wings 4–7 mm wide, glabrous, reticulate-nerved, denticulate, ciliolate. Leaves basal and cauline; basal leaves rosulate, the blades profoundly dissected, odd pinnate, the rachis 40–50 cm long, 8–10 pairs of leaflets, the leaflets ovate to lanceolate, 5–10 cm long, 2–6 cm wide, the margins dentate-serrate; cauline leaves alternate, sessile, decurrent, the blades oblong-lanceolate, 20–35 cm long, 7–11 cm wide, membranous, apically acuminate, the margins irregularly dentate-serrate, reticulate-nerved, glabrous, the nerves sparsely pilose. Capitulescences cymose-corymbose. Capitula 3–7(–20), radiate; pedicels 1–8 cm long, striate, swollen apically, densely pilose; calyculus (10–)16–22-bracteolate, the bracts narrowly linear, 1–2 cm long, 0.5–1 mm wide, acuminate apically, 1-nerved, greenish purple; involucres hemispherical, ca. 10 mm tall, ca. 10 mm wide; phyllaries (17–)22–28, weakly biseriate, equal, lanceolate, 8–10 mm long, 2–3 mm wide, fused at the base, glabrous or pilose, acuminate; ray florets 10–22, pistillate, the corolla yellow, the tube 0.5–0.6 mm long, glabrous, the ligule oblong-linear, 10–25 mm long, 4–8 mm wide, glabrous, 10–12-nerved, 2–3-dentate apically; disc

Figure 1. *Caxamarca sanchezii* M. O. Dillon & Sagástegui. —A. Flowering branch. —B. Portion of basal leaf. —C. Fleshy roots. —D. Capitulum. —E. Involucre. —F. Ray floret. —G. Disc floret. —H. Corolla lobes. —I. Stamen. —J. Style branches of disc floret. —K. Achene with pappus. —L. Enlargement of achene cross section. Illustration based on *Sagástegui, Leiva & Sagástegui 15185* (HAO).

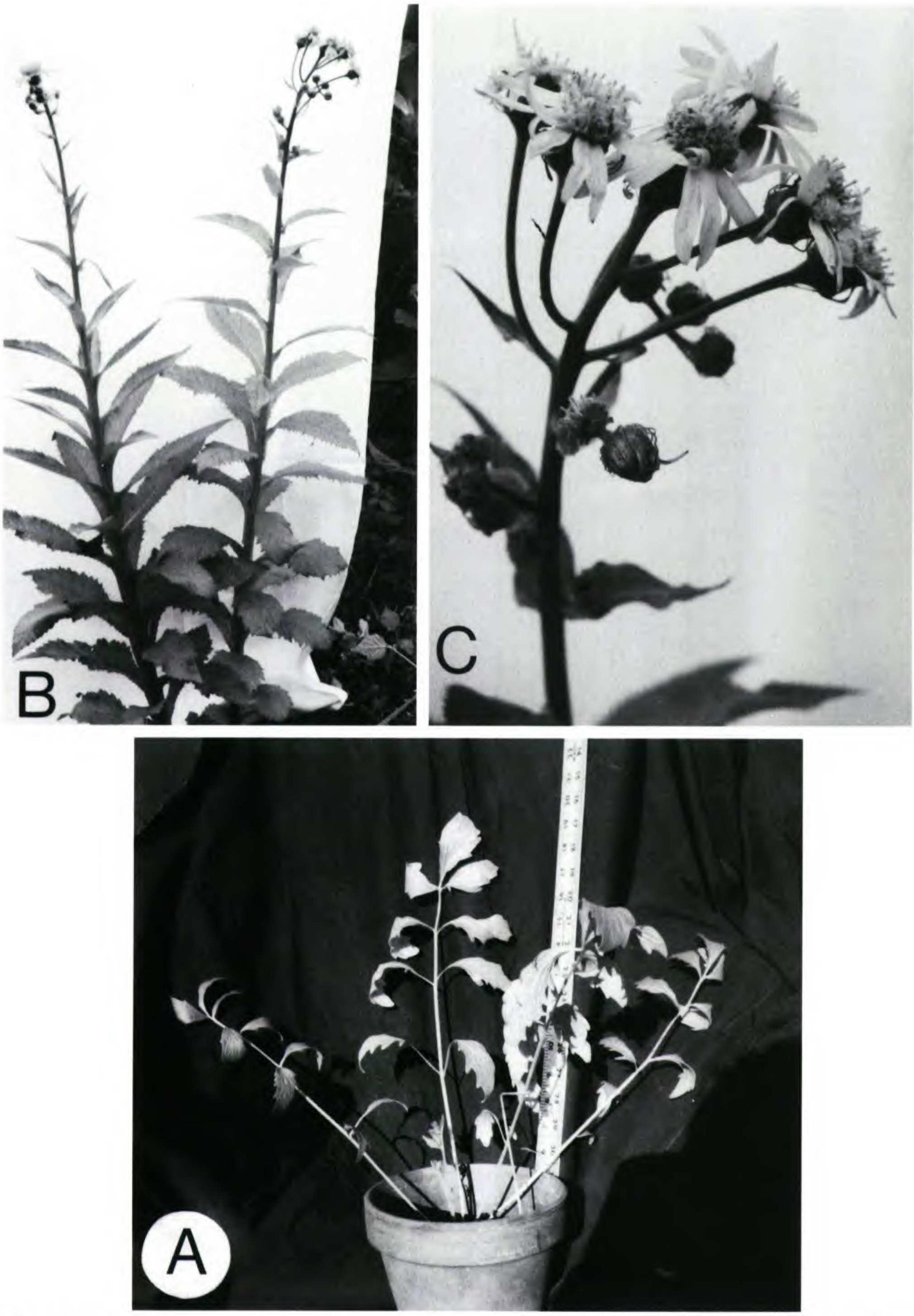

Figure 2. *Caxamarca sanchezii.* —A. Basal leaves in greenhouse grown plant (scale in inches). —B. Flowering stem photographed in the field. —C. Capitulescence.

florets 80–130(–160), hermaphroditic, the corollas yellow, tubular, 12–15 mm long, the throat slightly expanded, deeply 5-lobed, the lobes oblong, 2–2.5 mm long, 0.8–1 mm wide, apically obtuse, reflexed; anther bases sagittate, the filaments basal collar swollen or balusterform; style branches with parallel stigmatic lines, the apices conical with a terminal crown of penicillate trichomes. Achenes cy-

lindrical, 2.5–4 mm long, 0.5–0.6 mm wide, 10-costate, densely pilose with biseriate trichomes; pappus biseriate, persistent, the bristles subequal, barbellate, 6–7 mm long.

Distribution and ecology. *Caxamarca sanchezii* grows in clay soils in semi-arid open habitats with scattered deciduous small trees and evergreen shrubs. It is confined to the adjacent cuencas or drainage basins of the Río Chicama and Río Jequetepeque (1200–2200 m) in southwestern Department of Cajamarca. These areas are a part of the western or Pacific slope with the rivers draining to the Pacific Ocean. The prevailing weather pattern, and hence available moisture, is associated with coastal weather systems and unpredictable but recurrent El Niño conditions (Dillon & Rundel, 1990). Flowering is between March and May in normal years.

In favorable years, the associated floristic community is dominated by several annual Poaceae genera. Other species recorded from the collecting localities include *Acacia angustissima* (Miller) Kuntze (Fabaceae), *Caesalpinia paipai* Ruiz & Pavón, *C. spinosa* (Molina) Kuntze (Fabaceae), *Eriotheca discolor* (HBK) Robyns (Bombacaceae), *Cordia macrocephala* (Desvaux) Kunth, *C. munda* I. M. Johnston (Boraginaceae), *Solanum* sp. (Solanaceae), *Verbesina saubinetioides* S. F. Blake (Asteraceae), *Zinnia peruviana* (L.) L. (Asteraceae). The region also contains an association of several geophytes: *Ismene amancaes* (Ruiz & Pavón) Herbert (Amaryllidaceae), *Leptochiton helianthus* (Ravenna) Gereau & Meerow (Amaryllidaceae), *Stenomesson* sp. (Amaryllidaceae), and *Trichlora peruviana* Baker (Liliaceae).

Phenology. The life history of *Caxamarca* in the seasonally dry valleys of southwestern Cajamarca is closely connected with the yearly cycles of rain and drought. In the region where it is endemic, the rainy season typically begins in late December and rainfall increases steadily until March. By April the rains begin to decrease and by the end of May the area is completely dry once again. Rainfall between June and November is infrequent and of short duration. Soon after the rainy season begins, a series of long-petioled, basal leaves emerge sequentially, one every 4–5 days. Basal leaves are unknown from field-collected material since they are extremely ephemeral, but were observed in cultivated plants (Fig. 2A). In nature, the basal leaves are completely absent in flowering individuals; they develop and die back to the ground prior to the development of the flowering stems. The flowering shoot develops rapidly, and vegetative growth, flowering, and fruiting are completed within three months. After flowering, the stems die back and leave little trace of their existence until the next year. Some aspects of its autecology are similar to geophytes which begin their development with the coming of the rainy season and flower after the vegetative growth period.

Etymology. The generic name is derived from the original Spanish rendering of Cajamarca, the native Quechua name for this area in northern Peru. It is a pleasure to dedicate this new species to its first collector, Isidoro Sánchez Vega, the founder and current director of the herbarium at Universidad Nacional de Cajamarca (CPUN).

Paratypes. PERU. **Dept. Cajamarca:** Prov. Contumazá, Travesía de Andaloy (San Benito–Yetón), *Sagástegui & Leiva 15491* (F, HAO), *Sagástegui & Leiva 15536* (F, HAO); S. O. de El Rupe, Km 13 de la carretera Chilete–Contumazá, *Sánchez 2243* (CPUN); Chilete–Rupe, *Sánchez 4219* (CPUN, HAO); Cushtón (Chilete–Contumazá), *Sagástegui et al. 15628* (F, HAO), *Sagástegui et al. 15857* (F, HAO); Tambo La Lima (Cascas–Contumazá), *Sagástegui et al. 15548* (F, HAO); Prov. San Pablo, San Bernardino–Sangal, *Sagástegui et al. 15597* (F, HAO).

Discussion. Our studies in the Andean Senecioneae (Dillon & Sagástegui, 1988, 1996; Vision & Dillon, 1996; Sagástegui & Dillon, 1985) have revealed rich generic and species diversity. With this addition, Peru contains no fewer than 15 described genera and over 320 species within the tribe Senecioneae (Dillon & Hensold, 1993). This new genus belongs to the subtribe Senecioninae Dumortier, diagnosed by a series of microcharacters, including balusterform anther collars and style branches with separate stigmatic lines (Bremer, 1994).

The combination of characters displayed by *Caxamarca* does not allow its placement within any described genus known to us within the Senecioneae: the distinctive herbaceous perennial habit, with enlarged fleshy or tuberous roots, precocious basal leaves (Fig. 2A), scapose fistulose stems with decurrent cauline leaves (Fig. 2B), lax and few-headed cymes, and large capitula with conspicuous reflexed, bright yellow ray corollas (Fig. 2C). The style branches of the disc florets have parallel stigmatic lines and convex to triangular apices with a terminal crown of penicillate trichomes. This type of style apex is unlike those found in the large and diverse genus *Senecio* L.

Principal basal leaves and fibrous roots similar to those present in *Caxamarca* are known from other genera within the Senecioneae, for example, *Pippenalia*, a Mexican radiate genus once considered intermediate between *Cacalia* and *Senecio* (Barkley,

1985b; Barkley et al., 1996). Some species of *Senecio* develop prominent basal leaves, for example, the Brazilian *Senecio pulcher* Hooker & Arnott. The morphology of the basal leaves in *Caxamarca* is still an open question since basal leaves have not been collected in the field. While not common, fleshy roots with greatly thickened tubers do occur in some Mexican *Rolandas* (T. Barkley, pers. comm.) and in other tribes such as the Liabeae (e.g., *Munnozia sagasteguii* H. Robinson) occurring in this region.

In the key to genera provided by Vision and Dillon (1996), *Caxamarca* would key to *Dorobaea* Cassini. The large radiate hemispheric capitula with well-developed calyculus and numerous phyllaries are reminiscent of those found in *Dorobaea*, a small Andean genus distributed in northern Peru, Ecuador, and southern Colombia (Nordenstam, 1978; Nordenstam & Pruski, 1995). *Dorobaea* was established as distinct from *Senecio* on character differences in the habit, capitulescences, and floral morphology. The distinctness of the genus has been confirmed by cpDNA variation studies (Kadereit & Jeffrey, 1996). *Dorobaea* has deeply lobed or pinnate, basally rosulate leaves present at the time of flowering. It has a leafless, scapose capitulescence bearing a solitary, radiate capitulum. *Dorobaea* has slightly thickened fibrous roots, not unlike those in *Caxamarca*, but in *Dorobaea* the roots are typically no more than 7–10 cm long and ca. 1 cm in diameter. Within its range, *Dorobaea* is distributed in mesic habitats at elevations above 2000 m, and while *Dorobaea* and *Caxamarca* are both distributed in Cajamarca, they are ecologically and geographically isolated. The chromosome number for *Dorobaea* has been reported as n = ca. 50 (Dillon & Turner, 1982). A chromosome count for *Caxamarca* should be useful in efforts to determine the relationships of this genus (Robinson et al., 1997).

The following key is provided for Andean genera with herbaceous or suffrutescent habits, radiate capitula with a prominent calyculus, and conical to triangular style branch apices.

KEY TO *CAXAMARCA* AND POTENTIALLY RELATED ANDEAN GENERA

1a. Scandent, herbaceous perennials or suffrutescent vines; leaves strictly cauline; petioles not long-decurrent on stems; capitula radiate (rarely discoid).
  2a. Reclining, herbaceous perennials (typically hydrophilic); capitula radiate, the corollas yellow or orange; anther collar filament cylindrical, the theca bases rounded . . . . . *Garcibarrigoa* Cuatrecasas
  2b. Robust, suffrutescent vines; capitula radiate or discoid, the corollas orange or occasionally rose to purple; anther collar filament swollen or balusterform . . . . . *Pseudogynoxys* (Greenman) Cabrera
1b. Erect, herbaceous perennials; leaves basal, or basal and cauline with long-decurrent petioles; capitula radiate.
  3a. Leaves strictly basal, no cauline leaves evident; capitulescence a long-scapose, solitary capitulum . . . . . *Dorobaea* Cassini
  3b. Leaves basal and cauline; capitulescence cymose-corymbose . . . . . *Caxamarca* M. O. Dillon & Sagástegui

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